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(72) Inventors:
 • **Libera, Tony**
Morristown, NJ 07962-2245 (US)
 • **Zeiner, Peter**
Morristown, NJ 07962-2245 (US)

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(74) Representative: **Buckley, Guy Julian**
Patent Outsourcing Limited
1 King Street
Bakewell
Derbyshire DE45 1DZ (GB)

(71) Applicant: **Honeywell International Inc.**
Morristown, NJ 07962 (US)

(54) **Bi-modal air turbine starter assembly**

(57) An embodiment of a starter / drive turbine system (20) is provided that includes a bi-modal turbine assembly (70) and a controller (72). The bi-modal turbine assembly includes a housing assembly (74) having a flow passage (76) therethrough, a turbine wheel (78), an output shaft (80), a first gear train (82), a second gear train (84), and a switching device (86). The turbine wheel (78) is rotatably mounted within the housing assembly (74)

and positioned so as to be driven by pressurized air flowing through the flow passage. The controller is operatively coupled to the switching device and configured to cause the switching device to mechanically couple: (i) the first gear train between the turbine wheel and the output shaft in a Start Mode, and (ii) the second gear train between the turbine wheel and the output shaft in an Energy Conservation Mode.

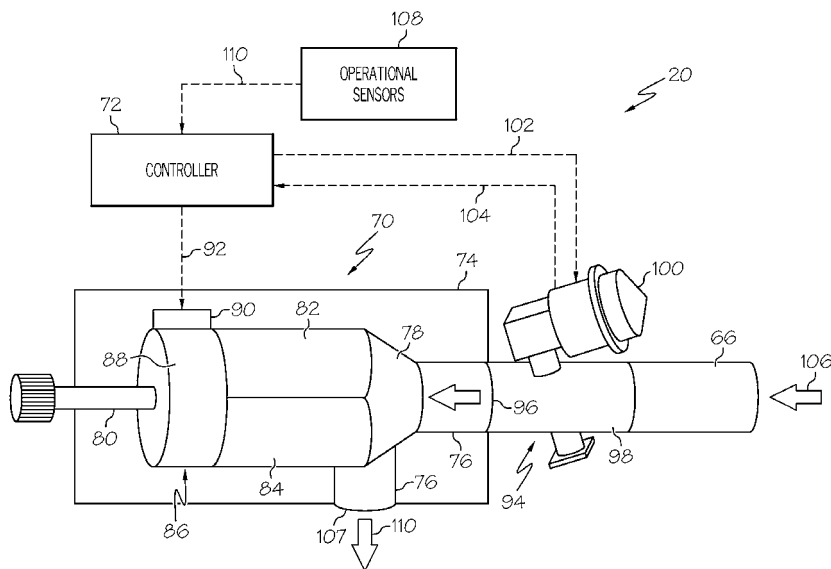


FIG. 2



EUROPEAN SEARCH REPORT

Application Number
EP 09 16 2221

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|--|---|---|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
| X | US 5 042 963 A (SORENSEN KAL K [US] ET AL) 27 August 1991 (1991-08-27) * column 1, lines 44-50 * * column 3, line 23 - column 5, line 52; claim 1; figures 1,3 * ----- | 1-3,6,7 | INV. F02C7/277 |
| A | US 2007/089420 A1 (KLINGELS HERMANN [DE]) 26 April 2007 (2007-04-26) * paragraph [0027]; figure 3 * ----- | 1-10 | |
| A | US 4 542 722 A (REYNOLDS RICHARD W [US]) 24 September 1985 (1985-09-24) * column 4, line 34 - column 5, line 15; figures 3,4,6 * ----- | 1-10 | |
| A | US 6 305 156 B1 (LUI CLARENCE [US]) 23 October 2001 (2001-10-23) * column 4, line 49 - column 5, line 17; figure 2 * ----- | 1-10 | |
| A | US 3 145 532 A (NORMAN MOSS) 25 August 1964 (1964-08-25) * column 1, line 46 - column 2, line 20 * ----- | 1-10 | |
| A | US 3 188 479 A (WOOD PALMER R ET AL) 8 June 1965 (1965-06-08) * column 2, line 22 - column 3, line 45 * * column 4, line 58 - column 6, line 23; figures 1,2 * ----- | 1-10 | TECHNICAL FIELDS SEARCHED (IPC) F02C F01D |
| The present search report has been drawn up for all claims | | | |
| Place of search The Hague | | Date of completion of the search 20 November 2012 | Examiner Steinhauser, Udo |
| CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document | | T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document | |

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ON EUROPEAN PATENT APPLICATION NO.

EP 09 16 2221

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The members are as contained in the European Patent Office EDP file on
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20-11-2012

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| US 5042963 A | 27-08-1991 | CA 2012304 A1 | 30-09-1990 |
| | | EP 0465531 A1 | 15-01-1992 |
| | | US 5042963 A | 27-08-1991 |
| | | WO 9012205 A1 | 18-10-1990 |
| ----- | | | |
| US 2007089420 A1 | 26-04-2007 | DE 10355917 A1 | 30-06-2005 |
| | | EP 1697623 A1 | 06-09-2006 |
| | | US 2007089420 A1 | 26-04-2007 |
| | | WO 2005054645 A1 | 16-06-2005 |
| ----- | | | |
| US 4542722 A | 24-09-1985 | DE 3477230 D1 | 20-04-1989 |
| | | EP 0167587 A1 | 15-01-1986 |
| | | JP S61500741 A | 17-04-1986 |
| | | US 4542722 A | 24-09-1985 |
| | | WO 8502887 A1 | 04-07-1985 |
| ----- | | | |
| US 6305156 B1 | 23-10-2001 | AT 287033 T | 15-01-2005 |
| | | DE 60017418 D1 | 17-02-2005 |
| | | DE 60017418 T2 | 23-03-2006 |
| | | EP 1208295 A2 | 29-05-2002 |
| | | US 6305156 B1 | 23-10-2001 |
| | | WO 0123724 A2 | 05-04-2001 |
| ----- | | | |
| US 3145532 A | 25-08-1964 | NONE | |
| ----- | | | |
| US 3188479 A | 08-06-1965 | DE 1426257 A1 | 19-12-1968 |
| | | GB 987878 A | 31-03-1965 |
| | | US 3188479 A | 08-06-1965 |
| ----- | | | |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82